SCIENCE

FRIDAY, SEPTEMBER 28, 1888.

NATURE SAYS, THAT, so far as numbers are concerned, the Bath meeting of the British Association has been below the average. The number of tickets sold has been about fifty less than two thousand, forming a marked contrast to last year's meeting, which beat the record. The diminished attendance has told to some extent on the grants, several of which had to be reduced below the sums originally proposed and approved of. The meeting next year will be presided over by Professor Flower. Among the grants allotted by the general council, the following may be mentioned. For the question of electrical standards £100 have been granted, the Ben Nevis Observatory receives £50, and six smaller amounts have been granted for researches in various branches of physics and chemistry. For the 'Geological Record' £80 have been allotted, and provisions have been made for studying the volcanic phenomena of Japan, the distribution of erratic blocks, and several paleontological and stratigraphical questions. The greatest grants have been allotted to the biological section. The Marine Biological Association and the Naples Zoölogical Station continue to be supported by the association by grants of £200 and £100 respectively. An amount of £100 each has been given to a study of the zoölogy and botany of the West India Islands and of the Friendly Islands. The same sum will be devoted to explorations of the geology and geography of the Atlas Range, and to an investigation of estuaries by means of models. In the anthropological section two important grants have been made, — one for continuing the studies on the north-western tribes of Canada of £150 ; and another of £100 for exploring the Roman Bath at Bath, a great part of which was excavated last year, and found in a remarkably good state of preservation. Besides this, a number of minor grants have been allotted, the total amount to be expended being £1,645.

THE ORIGIN AND DEVELOPMENT OF LANGUAGE.

THE existence of a great number of independent linguistic stocks offers one of the most difficult problems to ethnology. Numerous attempts have been made to compare apparently separate stocks, and to trace their origin, but there remain a great number which cannot be derived from a common source. The most recent theory on the origin of linguistic stocks is the one offered by Prof. Horatio Hale. It was first set forth in his address as vice-president of the anthropological section at the Buffalo meeting of the American Association in 1886, and more fully expounded in a paper read recently before the Canadian Institute at Toronto.

The foundation of this theory is the frequently observed fact that children occasionally form a language of their own, apparently totally different from that of their parents. Hale has carefully compiled observations on this subject, and gives in both his papers very interesting and remarkable instances of such languages. He assumes that in a favorable climate a group of children may have become separated from grown-up persons, and thus developed a language of their own. He assumes that the process of forming dialects is entirely and fundamentally distinct from that of forming linguistic stocks. He concludes that children's languages of the type mentioned above are formed at one stroke, complete in all their grammatical elements. A few of the examples mentioned go far to show that this view is correct ; but so far we miss the proof that these languages are really fundamentally distinct from that of the parents, as no philologist has ever studied one of them thoroughly. Hale explains the similarity of groups of linguistic stocks in regard to their structure by assuming a potential faculty in the child to develop on a certain line. Such a faculty, in as complex a phenomenon as speech is, seems to us very improbable, and we are more inclined to see in such structural similarities a genetic connection.

Undoubtedly Hale has pointed out for the first time one of the most potent factors in the evolution of language, and the problem he propounds is so important that it ought to be taken up energetically.

As in every community child-language dies before being far advanced, it is self-evident that Hale's theory holds good only in such countries where a complete isolation of a few individuals, and complete interruption of their intercourse with the tribe from which they separated, are possible. Such can only have been the case where vast tracts of land were uninhabited ; and, as this is no longer the case, the non-occurrence of such phenomena in historic times cannot be considered proof against the theory. One phenomenon of great importance we will mention in this place, as it is greatly in favor of Hale's theory, but unfortunately we do not know whether the authority is a good one. The children of a tribe of hunters in South Africa are said to speak a language of their own, which they do not give up until they take part in the expeditions of their parents. If this really means that a language has developed, spoken by all the children of the tribe, it would be an important step on the line indicated by Hale.

If this theory is correct, the difference between the development of dialects and linguistic stocks cannot be as fundamental as Hale assumes. Wherever occasion is given for a complete isolation of a few children, occasion also arises for an isolation of a few adults and many children, forming one household. In this case the language of the children may gain a dominating influence over that of the adults. The result of such an event would be a language similar in structure to the original language, while the vocabularies would be distinct in important features. It seems probable that children's speech may have had a great influence in the origin of dialects of certain linguistic stocks in which numerous words occur that have undoubtedly originated independently in the respective dialects. The probability of such an event has been recognized by Hale, who points out that his theory explains the fact that certain words are common to a great number of stocks, although they may differ in all other respects. He thinks that such words were remembered by the children, and retained in their new language. The character of the new language will also depend entirely upon the stage of development of the language of the respective children. We all know that the common baby-talk has to a certain extent the same, although simplified, structure as the mother-tongue, while its vocabulary includes many independent words. Undoubtedly there exist numerous intermediate stages between such baby-talk and a child-language of absolutely independent character — if such exists. Therefore, if these languages really gave rise to new languages, we might expect to observe a gradual shading-off between dialects and stocks. It is very probable that by the process suggested by Hale numerous new elements may have developed in the language of isolated families.

We are not inclined to accept his theory as explaining the origin of stocks entirely distinct in structure until it has been proved that a child's language of such character exists. Our reason for this opinion is, that a child's language cannot originate until the child has learned from its parents, and from other people with whom it comes in contact, that speech is a means of communication ; that is, until it has apperceived the connection of certain sounds with certain other sensations. Therefore it seems probable that even an apparently independent child's language must be to a great extent influenced by the language it hears.

Therefore it appears of the greatest importance that the child's language should be studied in all its aspects. Some of the in-

stances mentioned by Hale are of the greatest interest, and we reprint one here, as it shows clearly what the subject of this study ought to be. In his second paper on this subject, Hale quotes from a letter from Von der Gabelentz the following: "My brother Albert's eldest son George, before he had learned his mother-tongue, called things by names of his own invention. In these names the constant elements were the consonants, while the vowels, according as they were deeper or higher, denoted the greatness or smallness. For instance, his term for ordinary chairs was *lakail*, apparently quite a self-made word. Now, he would call a great arm-chair *lukull*, and a little doll's chair *likill*. The root for round objects was *m-m*. He called a watch or a plate *mem*, but a large plate or a round table *mum*; the moon was likewise *mem*, but when he first saw the stars he said *mim mim mim mim*. His father, and at first every grown-up male person, was called *papa*, till he learned to distinguish between Papa and Grosspapa (*o papa*), and henceforth called all other gentlemen *o-papa*. Now, I am a head taller than was my father. So one day, when seeing my father and me together, baby called the former *o-papa* and me *u-pupu*. One day in winter he saw his father in a large fur cloak and with his hat on. This impression he uttered with the word *pupu*, meaning a very big papa. The boy soon gave up his idioglottic endeavors, learning German before his next-born sister had reached the age of beginning speech. So *that* language could have no further grammatical development."

THE GREAT MEDICAL CONGRESS.

The First Triennial Session in Washington. — A Series of Brilliant Meetings. — Some of the Papers read. — Distinguished Guests.

THE meeting of the Congress of American Physicians and Surgeons, which took place in Washington last week, continuing three days, marked a new departure in national gatherings of American medical men. It was a convention of specialists, of men who have pursued their investigations, each in his own department, far beyond the point reached by the ordinary practising physician, even though his professional equipment be of the best. The papers that were read, therefore, presented the results of the most advanced scientific researches in the several departments, and the organization of the congress is such as to insure in the future the maintenance of this high scientific standard. All opportunity for scheming medical politicians to gain prominence or office is carefully guarded against, and the only chance that any physician has to gain distinction through membership of the congress is by presenting papers of such high order of excellence as to command the attention and secure the approval of the learned members of the medical profession to whom, as to the most competent critics, he submits his work.

Perhaps the best idea of the scope and objects of the congress may be gathered from the address with which Dr. Pepper of Philadelphia, chairman of the executive committee, opened the first session. He said, —

"On behalf of the executive committee, I have the honor to announce to you, the members of the various special associations composing the Congress of American Physicians and Surgeons, the manner in which we have discharged the responsible duty intrusted to us. The present meeting is the result of prolonged deliberations. The development of one special society after another showed the irresistible tendency of the recent progress of medical science. The deep interest which attaches to the meetings of these separate bodies suggested naturally the thought of a conjoint meeting, which would bring together the active workers in allied fields. This thought began to take definite shape as much as four years ago, before the attention of the medical profession became occupied with the preparations for the meeting of the International Medical Congress which occurred in this city last year. But all action was deferred, in order that there should not be even the semblance of interference with that important meeting. The delay has not been injurious. It has rendered more than ever conspicuous the actual need of an organization to secure the re-union, at stated intervals, of the more active teachers and writers and workers in the leading branches of medical science. Such re-unions must be at a locality to which it will be possible to draw such men from all quarters.

"In order to produce the best scientific results, it is essential that the members in attendance shall be reasonably limited, and that as far as possible the same men shall attend successive meetings. A continuity of intellectual life and activity is thus secured, which increases greatly the benefits derived from these meetings. A large proportion of those interested in the development of such an organization are, as I am myself, warmly attached to the American Medical Association, and determined to exert their influence to maintain and promote the success of this great national organization. All are no less warmly interested in the prosperity of the various special societies to which they severally belong. Your executive committee found little difficulty, however, in deciding upon a plan which would avoid even the least interference with the American Medical Association, while at the same time it avoided any encroachment upon the independence and autonomy of the special societies. It is unnecessary to dwell upon the special points which have been embodied in the by-laws which will be immediately submitted to you.

"Your committee ventures to hope that these provisions, which are strictly in accord with the terms of the resolutions under which they were appointed, will meet the unanimous approval of the congress. We have recommended that the sessions shall be triennial, thus leaving to each participating body two intervening independent meetings, at such time and place as may be chosen. We have jealously guarded against the admission of any parliamentary business into the work of the congress, the functions of which are designed to be absolutely and exclusively scientific. Thus, and thus only, can the sessions of this body be lifted up into and maintained in that high and cool air of learned discourse which best permits the diffusion of truth and the promotion of science. We have no less jealously guarded the independent sovereignty of each participating society. To all their full rights are preserved; to all equal privileges are accorded; upon all the burden of expense, which should always be but a light one, has been laid in equitable distribution. The successive meetings of the congress will be held in this beautiful city, which every year renders more accessible, more attractive, and more precious to every citizen of the Republic. Nor could we fail to make acknowledgment of the great material advantages we shall enjoy in these meetings here, through the liberal and enlightened policy which places freely at our disposal the admirable facilities of the medical department.

"And, lastly, your executive committee would report that in the discharge of one of the most important of our duties we have reached the conclusion that the selection of the president of each congress shall be intrusted to the executive committee then in office. Thus will the choice of the most worthy and most representative men of the whole country be insured at the hands of a truly representative body, specially selected by their various societies for their ability and judgment. The powers you are asked to confide to future executive committees are large, but they will be reposed in safe hands. Each society participating will be stimulated to continuous and lofty effort. Membership in any of these bodies will come to be regarded as more and more an honor, and in time the scientific qualifications of candidates will be more and more strictly scrutinized. Can there be any doubt, that, if the spirit which has led to the formation of this congress be maintained and cherished, this new organization will exert a powerful and beneficent influence on the future medical science? It remains, then, only to add, that, in exerting the privilege of selecting a president for this first Congress of American Physicians and Surgeons, your executive committee feel they have been guided to the choice of a man whose admirable personal character, whose high attainments, and whose illustrious services in the cause of literature, of science, and of the entire medical profession, mark him as entitled to this great honor and distinction. It gives me, therefore, the utmost gratification to present to you our president, Dr. John Shaw Billings, and to announce that the Congress of American Physicians and Surgeons is now duly organized."

Dr. Billings, on taking the gavel, in a few words expressed his appreciation of the honor which had been conferred upon him. His formal address was given on Thursday evening, and was published in last week's *Science*.

The address of welcome by Dr. S. C. Busey of Washington,

chairman of the committee's of Surgeons, was warm and cordial He spoke of Washington as a great scientific centre, as it is. It would probably have surprised the members of the congress if he had added, as he might have done, that there are in Washington more than nine hundred men who are engaged in scientific work. It may be remarked here that the work of the committee of arrangements from beginning to end — from the banquet on the evening before the congress met, to the magnificent reception with which it closed — is worthy of the warmest commendation.

At the first meeting of the congress, also, Dr. Pepper submitted the following rules of organization, which were adopted: —

"1. This organization shall be known as 'The Congress of American Physicians and Surgeons.'

"2. It shall be composed of national associations for the promotion of medical and allied sciences.

"3. It shall hold its sessions triennially in the city of Washington, D.C.

"4. The officers of the congress shall be a president, vice-president, a secretary, a treasurer, and an executive committee.

"5. The president shall be elected by the executive committee, of which he shall be *ex officio* a member.

"6. The presidents of the participating societies shall be *ex officio* the vice-presidents of the congress.

"7. The secretary and the treasurer shall be elected by the executive committee. They shall be *ex-officio* members of the executive committee.

"8. The executive committee shall be composed of one member from each participating society, and said members shall be elected by the various societies at the next annual meetings subsequent to the congress.

"It shall be charged with all duties pertaining to the organization of and preparation for the ensuing congress, including the election of all officers and of a committee of arrangements.

"It shall superintend the publication of the transactions of the congress.

"9. The expenses of the congress shall be divided between the participating societies in proportion to their membership.

"10. The admission of new associations to participation in the congress shall be by unanimous vote of the executive committee."

Typhoid-Fever.

The eleven medical and surgical societies from the membership of which the congress is composed held their annual meetings during the three days of the congress. A great number of papers were read, a few of which, only, it will be possible to mention here.

At the Tuesday meeting of the Association of American Physicians, Dr. W. W. Johnston of Washington presented an important paper on 'The Geographical Distribution of Typhoid-Fever in the United States.' In brief, he said: "Typhoid-fever is admitted to be a very generally distributed disease in the United States, but there is a great difference of opinion as to what constitutes typhoid-fever, — what symptoms are essential to its recognition. The difficulties lie in the fact that typhoid-fever is frequently a very mild disease, with few of the characteristic symptoms; and that sometimes the illness is so slight that its true nature is not recognized until some sudden accident, as hemorrhage from the bowels or perforation, reveals its true nature. The difficulty is increased still more by the simultaneous occurrence, in malarial districts, of forms of fever which have some of the symptoms of typhoid-fever and some of malarial-fever. The question is to determine to which category such obscure or doubtful cases belong. In the present paper the effort was made, by a study of the prevailing forms of continued fever in different portions of the country, to determine the relative value of their symptoms, and to arrive at more precise rules of diagnosis. Such a study reveals the fact that the principal forms of fever recognized are (1) true typical typhoid-fever; (2) true typical malarial (remittent or bilious) fever; (3) adynamic malarial-fever; (4) typho-malarial fever; (5) anomalous obscure forms appear as simple, continued fever, gastric-fever, autumnal-fever, etc. An analysis of the symptoms given by physicians in different parts of the country shows that great difference of opinion prevails as to the symptoms of these fevers; but such an analysis and comparison show also that true typical typhoid-fever and true remittent-fever are clearly defined; that 'adynamic remittent-fever' is a term which is used to designate a class of fevers consisting partly of remittent-fevers, and partly of typhoid-fever of a typical character. In regard to typho-malarial fever, no fixed ideas exist as to what symptoms indicate it; and so great is the confusion, and so hopeless the task of giving this disease an appropriate place, it is clear that much would be gained by abandoning the terms altogether. As regards the obscure forms mentioned, there is the tendency to class many of them under the head of mild or typical typhoid-fever. But there is a great deal yet to be learned about these forms; and much progress can be made by a close study of the micro-organisms found in the blood of these cases, and by a closer study and unbiassed appreciation of their symptoms."

Heat-Centres in Man.

In the Tuesday meeting of the American Neurological Association, the paper that probably was of most popular interest was that read by Dr. Isaac Ott of Easton, Penn., on 'Heat-Centres in Man.' He showed by cases of disease that in the brain of man are points whose function it is to preside over the temperature of the body, and to keep its heat constant. These centres were partly located upon the surface and partly at the base of the brain. He also related cases on record of a temperature as high as 128° F., and as low as 94° F. He explained how these great changes of temperature could be produced through disease of the nervous system. Cases of children were detailed whose temperature was 110° F. for a short time and recovered. Fever was stated to be mainly a disease of the nervous system, causing increased chemical changes in the tissues of the body, and thus elevating the temperature.

Searching for the Yellow-Fever Germ.

At the meeting of the Climatological society on Wednesday, Dr. G. M. Sternberg, surgeon U.S.A., read a very important paper, in which he gave a report of the result of the search for the yellow-fever germ which he has been prosecuting under the direction of the President. The title of his paper was 'Recent Investigations relating to the Etiology of Yellow-Fever.' The subject is one which, on account of the prevalence of this disease in the Southern States, is just now of absorbing interest, not only to the medical profession, but to the public generally. Dr. Sternberg said that there have been several different claimants to the honor of having discovered the yellow-fever germ, but none of these claims are well founded. He exhibited to the association cultivations of the germs of Dr. Domingos Freire of Brazil, of Dr. Carlos Finlay of Havana, and of Dr. Paul Gibier of France. The last-named physician was commissioned by the French Government to study yellow-fever, and had already been in Havana for several months, when, in May last, Dr. Sternberg arrived in that city in compliance with instructions from the President to continue the investigation commenced last year in Brazil and in Mexico.

Through the courtesy of the Spanish army-surgeons at the military hospitals in Havana, Dr. Sternberg was able to obtain as many autopsies as he required, and made a careful search of the blood in the various organs of the body with reference to the presence of germs. He did not encounter in a single case the microbe which Dr. Domingos Freire has described, and with which he professes to practise protective inoculations. He has, however, encountered this micrococcus in cultures made from the surface of the body, and believes its presence in Dr. Freire's blood-cultures from the finger to have been quite accidental and without special significance.

Having proved by his microscopical researches and culture experiments that there is no specific germ in the blood of yellow-fever patients, Dr. Sternberg turned his attention to the alimentary canal, thinking it not improbable that the specific germ of the disease might be located there, as it is the case in cholera. As was to have been expected, he encountered a variety of micro-organisms in this situation, some of which were apparently undescribed species, and therefore possible yellow-fever germs. Among these is the bacillus of Dr. Paul Gibier, which was found in three out of ten cases. According to Dr. Sternberg, Dr. Gibier has not as yet given any satisfactory proof that this is the veritable yellow-fever germ, and further researches are required in order to determine the important questions relating to the cause and prevention of this disease. Dr. Sternberg has himself discovered several new micro-

organisms, and it is possible that one or the other of these is the deadly microbe which he has so long been in search of; but he is not at present in a position to make a definite claim with reference to any one of them. Some of these germs were exhibited to the association; and Dr. Sternberg stated that since his return from Havana he had been continuously engaged in the study of these various microbes, and that the material which he had brought with him would fully occupy his time for some months to come.

Consumption among the Indians.

At the same meeting, Dr. W. Matthews of the Army Medical Museum read a paper entitled 'Further Contributions to the Study of Consumption among the Indians.' Before a meeting of this society, held in Philadelphia two years ago, Dr. Matthews presented a paper on this subject, in which he brought forward statistical evidence to show that consumption increases among Indians under the influence of civilization, i.e., under a compulsory endeavor to accustom themselves to the food and habits of an alien and more advanced race, and that climate has very little to do with this increase. The Indian race, which is native to the climate, suffers more from consumption than the white and colored races, which have only recently appeared on the western continent. As a rule, too (to which there are some exceptions), the tribes that live in the Eastern States, and have been longest under the influence of civilization, suffer most from consumption and allied diseases. In the present paper the author brings out much additional evidence to strengthen the conclusions of his first paper, and endeavors to discover the causes of this consumptive tendency among Indians. He believes that the disease with them is usually complicated with scrofula, in short that it is scrofulous phthisis, and that in studying it we must seek for the causes of scrofula. Chief among these is improper and badly cooked food. Other causes are bad dwellings and insufficient clothing. Still it is strange that the colored population, who are often as badly housed and fed as the Indians, are more healthy. This is partly accounted for by difference of disposition, the Ethiopians being the more light-hearted race. Much of the difference, too, arises from the fact that all Ethiopians, whether rich or poor, fair or dark, are placed by statisticians under the head of 'colored;' while people of Indian descent, who live among whites, and sever their tribal relations, are classed as whites, only the poorer and less prosperous remaining on the Indian census-rolls.

Cerebral Localization.

The most brilliant meeting of the congress proper was that of Wednesday evening, when one of the most interesting subjects in medical science, cerebral localization, was discussed by several of the most distinguished specialists of the world. Dr. Charles K. Mills of Philadelphia, the professor of diseases of the mind and nervous system in the Philadelphia Polyclinic and College for Graduates in Medicine, opened the discussion, the topic being 'Cerebral Localization in its Practical Relations.' He was followed by Dr. Roswell Park, professor of surgery in the Buffalo Medical College. Both of these gentlemen read papers, which were discussed by Dr. David Ferrier and Mr. Victor Horsley of London, England, Dr. W. W. Keen of Philadelphia, and Dr. Robert F. Weir of New York City. Diagrams were displayed on the wall, and by their aid the various speakers pointed out the brain-centres. Dr. Ferrier, one of the original discoverers of brain-centres, claimed that they were distinct areas, while Mr. Horsley was of the opinion that they overlapped. Dr. Mills's paper was an exhaustive one, describing the results of the latest modern discoveries. Dr. Park covered about the same ground, and his paper was regarded as a masterly exposition of the subject.

Distinguished Guests.

The congress was notable for the distinguished guests of several of the constituent societies who were present and participated. Among these guests, Dr. Frederick von Esmarch of Kiel, Germany, was probably the most distinguished. He was accompanied by his wife and son, the former being Princess Caroline Christian Augusta Emily Henrietta Elizabeth of Schleswig-Holstein-Souderburg-Augustenburg. She is aunt of the Empress of Germany. Dr. von Esmarch is director of the surgical clinic in Kiel. During the Franco-Prussian war he was a surgeon on the staff of the Emperor, and is recognized from the leading surgeons of the world. He is a voluminous writer, and nearly all of his works relate to the antiseptic treatment. He has endeavored to ameliorate the horrors of war by the introduction of improved sanitary measures in the treatment of the wounded, and also by suggestions in case of sudden accident. He first suggested the method of artificial bloodless operations, which was generally adopted. He has received honors abroad and at home, and wears decorations of the highest order.

Among the other foreign guests were Dr. David Ferner of London, England, one of the leading medical writers of the day, joint editor of *Guy's Forensic Medicine*, professor in King's College, and physician in King's College Hospital; Dr. Victor Alexander Haden Norsley of University College and Brown Institute, England; Dr. W. M. Graily Hewitt of London, England, a distinguished author and professor; Dr. Lawson Tait of Birmingham, England, president of the Birmingham Philosophical Society, and author of 'Diseases of Women,' a recognized text-book for students and practitioners; Sir Spencer Wells of London, England, surgeon to the Queen's household, and an extensive writer on medical subjects; Sir Andrew Clark, also of London, president of the London Medical Society; Sir William MacCormac, author of 'Notes and Recollections of an Ambulance Surgeon,' which has been translated into several continental languages; Dr. William O. Priestly of London, a voluminous contributor to medical literature; Dr. William Ord of London, a physician and lecturer of high rank; Dr. Thomas Bryant of London, lecturer on surgery in Guy's Hospital; Dr. Reginald Harrison of Liverpool, England; and Dr. Arthur E. Durham of London, England. Several of these distinguished guests, by invitation, read papers or joined in the discussions.

In every respect the congress was successful. It contributed to the advancement of the highest medical science, and has furnished a stimulus for future work.

MAJOR POWELL'S REPORT.

Operations of the National Survey. — Yellowstone Park. — Atlantic Coast Work. — Archæan Geology. — Glacial Geology. — Appalachian Division; Classification of Soils.

Operations of the National Survey during the Year ending June 30, 1888.

DIRECTOR POWELL of the United States Geological Survey has completed his report for the last fiscal year, and Sept. 6 transmitted it to the secretary of the interior. There will probably be several months' delay in the publication of it, owing to the lack of facilities in the Government Printing-Office; but the Washington correspondent of *Science* has been permitted to make the following full extracts and summary from the manuscript copy. This is the first publication of this report.

In the topographic department an area of 52,062 square miles was surveyed during the year. In regard to the scale on which the topographic maps are made, the director says, "In the earlier work of the Geological Survey it was contemplated that a large part of the general topographic map should be projected upon a scale of four miles to the inch. . . . The last two years, however, have brought great improvements in the methods of work, in the instruments and appliances, and, above all, in the skill and efficiency gained by the topographers through experience and zealous emulation. The cost of the work per unit of area upon any given scale has greatly diminished, the quality and accuracy of the work has been much improved, and the rapidity with which a given grade of work may be accomplished has increased. At the same time the demand for maps of greater detail, and upon a larger scale than four miles to the inch, has been rapidly growing, not merely for scientific purposes, but far more for economic purposes.

"The general utility of a map two miles to the inch is, for all purposes, many times greater than that of a map four miles to the inch; and a further increase of utility follows from increasing the scale to one mile to the inch. . . . It has therefore become practically imperative to enlarge the scales in some regions, while the original four-mile scale is still adhered to in the regions of high mountains and arid plains and plateaus. The increased cost which (other things being equal) necessarily attends the production of larger

scale and more accurate more metamorphism great measure been offset by more economic and more efficient service, resulting from constantly growing experience and skill in field and office work."

Yellowstone Park.

"Under the charge of Dr. Arnold Hague," says Director Powell, after treating of several other topics, "the survey of the National Park has made much progress. A topographic map of the Mammoth Hot Springs basin has been made by Mr. Anton Karl of the topographic corps, and maps of the other geyser basins have been completed. Dr. Hague's geologic work has been prosecuted in the eastern portion of the park, in the comparatively little-known area around the northern part of the Wind River Range and the Absaroka Range, which constitute some of the grandest features of the region. His inquiries have thrown much light on the geologic history of the features of the park, and of the volcanic processes which produced such wonderful results. Many instructive studies have been made of the action of the geysers and the hot-springs, and of the mineral deposits to which they have given rise.

"Dr. Hague's attention has been forcibly drawn to the importance of this reservation as a storage-area for the head waters of some of the largest upper tributaries of the Missouri, and also of the Snake River. Yellowstone Lake is the largest natural reservoir of the Rocky Mountain region, and may be made an important factor in the prosperity of future populations of the country adjoining the lower courses of the Yellowstone, who will be dependent upon its waters for irrigation. Dr. Hague has devoted much time to the investigation of this important subject, and has obtained information which cannot fail to be of great value in the future deliberations of Congress upon questions relating to its policy towards the public lands upon this broad watershed of the continent."

Atlantic Coast Work.

"The examination of swamps and marsh-lands," continues Major Powell, "has been continued during the past year under the charge of Prof. N. S. Shaler. The large area of such lands along the Atlantic coast south of New York, and their situation upon the coast-line, make them especially important, and even a subject of solicitude in relation to the future development of the country. Deleterious to health in their natural condition, an obstacle in the way of approach to the sea, repellent to the settler, to agriculture, and to manufacturers, they yet hold out the hope of highly productive utilization through the judicious application of capital. Wherever they are susceptible of effective drainage, they are generally among the most valuable lands for agricultural purposes, and their unhealthful condition is ameliorated, or even wholly remedied. There are over 100,000 square miles of such land in the United States, a large proportion of which, by good engineering, can be rendered highly productive. Much of it abounds in peat or iron ores, and in South Carolina and Georgia it contains the products of phosphates, which are collected and treated in chemical works in steadily increasing quantities. The swamps and overflowed lands of the interior present analogous conditions. Professor Shaler has visited the Everglade region of southern Florida, along the coast, to ascertain the general facts with reference to the possibility of drainage, and with highly encouraging results. He has investigated such evidences as were accessible, bearing upon the origin of the topographic features of the southern part of the peninsula, and especially those which are indicative of elevation or subsidence of the land in recent geologic time. He has also made a preliminary study of the phosphate deposits of South Carolina, and the results have been put in form to be published as a bulletin of the Survey.

"Progress has been made in mapping the swamp districts of Massachusetts, and Professor Shaler has completed the mapping of those occurring in the vicinity of Abington and Newburyport. A large amount of special geologic work, bearing upon particular questions now under investigation, has also been done under Professor Shaler."

Archæan Geology.

"In many parts of the United States extensive exposures of very ancient strata occur, embracing in some cases formations which are older than the oldest fossiliferous rocks of assignable age. In other cases there are formations of the same ages as some of the fossiliferous beds, but in a condition which indicates that they have undergone great changes since their deposition. Not only have their component beds been tilted, bent, folded, dislocated, and distorted to extreme degrees, but their mineralogic contents and their textures have been more or less altered. One effect of this metamorphism has been the obliteration of any fossils they may have contained originally, upon which the geologist mainly relies in determining the ages and relations of strata. The confusion into which these masses have been thrown by the forces which have fractured and distorted them has increased the difficulty.

"The present state of knowledge relating to the origin, relative ages, and former condition of these strata, to the nature of the processes which have wrought these profound changes in their constitution, and to their relation with each other, is very unsatisfactory, although no rocks have been more earnestly studied. While the knowledge which has been gained is vast in amount, and highly useful in its way, it has not been of such a character that it could be grouped and generalized into broad inductions, and it has thrown comparatively little light upon the most important questions.

"There are large areas in the United States where these rocks are exposed. The most extensive are in the New England States, the southern Appalachians, the vicinity of Lake Superior, and many parts of the great mountain region of the West, and especially the ranges upon and near the Pacific coast. It is deemed of importance to the interest of geologic science in general — both of systematic and economic geology — to take up this subject and prosecute investigations of the older crystalline rocks with vigor. The two fields which are regarded as offering the best opportunities and prospects for these investigations are the New England States and the Lake Superior region. In the former field, Prof. R. Pumpelly has been diligently at work with several assistants. Convinced that the Green Mountains of Vermont and Massachusetts are more likely to yield desired results and to clear up the broader questions relating to the geology of New England, he has divided the country into zones across those mountains, and is prosecuting the investigation of their structure in great detail. He has already ascertained the components of the Green Mountain series of strata, has gained considerable knowledge of their lithology and relations, and has made much progress towards unravelling their complicated structure, and learning the processes by which their metamorphism has been effected."

After a brief account of the investigation of corresponding horizons in the Lake Superior region, closing the notice with a deserved tribute to the late Prof. Roland D. Irving, who was in charge of this work, and who died in May last, Major Powell passes to a brief review of the work done during last year in the glacial division.

Glacial Geology.

"The study of the vestiges of glaciation," says the director, "has been conducted by Prof. T. C. Chamberlin. The New England States, New York, a large part of Pennsylvania, and in general the States north of the Ohio River and east and north of the Missouri, constitute a region whose superficial deposits and soils, whose lakes and minor topographic features, have been profoundly modified, and in great part made what they now are, by the action of glaciers. This region, as well as the basins of the Great Lakes and the Canadian Provinces indefinitely northward, was doubtless during a recent geologic period sheeted over with ice in a manner which finds a counterpart in the present condition of Greenland. This conclusion — and a similar one has been reached with respect to certain portions of Europe — rests upon a vast mass of circumstantial evidence so clear and convincing, when fully understood, that it may be regarded as one of the most wonderful and pleasing examples of inductive reasoning, and one of the best established that the whole realm of modern science affords. Professor Chamberlin's work has been the investigation of the extent of this former field of ice and its boundaries, the nature of its action in shaping surface features, the chief incidents of its history, and the geologic and climatic changes which were associated with it, whether as causes or effects.

"Near the close of the glacial period there existed, in the region now embraced in the valley of the Red River of the North and that of the Saskatchewan, a great lake, to which the name of Lake Ag-

assiz has been given. Its former existence was first clearly shown. and its approximate limits roughly defined, by the late Gen. G. K, Warren of the Engineers. A considerable arm or bay of this lake extended up the Red River valley into Dakota and Minnesota. Its ancient beaches are still easily discernible, and its bottom received the deposits of sediment ground from the rocks by the great continental glacier upon whose western margin the lake was situated. These deposits constitute those soils of the Red River valley which have lately become so famous for their fertility. In co-operation with the Canadian Geological Survey, in whose territory the greater part of Lake Agassiz was situated, Professor Chamberlin's assistant, Mr. Warren Upham, has made a study of the portions of this lake-basin and of its branches which lie within the United States. This work has already occupied Mr. Upham during several seasons, and is still in progress, and has brought to light many instructive and important facts. Examinations have also been made of the glacial deposits in the Coteau du Plateau du Missouri of Dakota, by Prof. J. E. Todd; in northern Illinois and adjacent parts of Indiana and Michigan by Mr. Frank Leverett; in Wisconsin by Mr. I. M. Buell; in Indiana by Prof. L. C. Wooster; and in Maine by Prof. George H. Stone. Large and important additions have thus been made to our knowledge of the distribution and action of the ancient ice-sheet, and of the history of the continent during the glacial period."

Appalachian Division. — Classification of Soils.

Probably the most important section of Major Powell's report is that in which he announces a new, scientific, and systematic classification of soils. He has long been engaged in the study of this subject, and has given his classification to some specialists and institutions, but this is the first publication of it. It will attract wide attention on account both of its scientific and its economic importance.

After briefly stating the progress of the geologic work of the year in the Appalachian division, under the direction of Mr. G. K. Gilbert, Major Powell proceeds: "The soils of the region are derived from the rocks. In part they are constituted by disintegrated rock not otherwise disturbed, and holding its original position; but in part they also result from the transportation and sorting of disintegrated rock by streams, waves, glaciers. The complete mapping of the geologic features thus shows the distribution of the soils, and it has been determined to separate the data concerning soils, and prepare a soil-map to accompany each geologic map. The field-parties gather data for both at the same time.

"In planning this work it has been found necessary to adopt a working classification of soils. The following is an exhibit of the scheme. It is held only as a tentative classification, to be enlarged, modified, or reconstructed, as the facts developed in the progress of investigation may demand.

"*Endogenous soils* are those derived from the country rocks, and remaining in place.

"*Exogenous soils* are those derived from other sources than the country rocks proper to the district where the several soils are situated.

"*Endogenous soils* are classed in conformity with the rocks from which they are derived, as,

"I. Sandstone soils.
"II. Limestone soils.
"III. Granite soils, etc.

"*Exogenous soils* are classed as,

"I. Alluvial soils; i.e., those formed from deposits on flood-plains made by running waters.
"II. Lacustrine soils; i.e., those formed from deposits in lakes.
"III. Marine soils; i.e., those formed from deposits made by the action of waves and currents along the shores of the sea.
"IV. Drift soils; i.e., those formed from deposits made by glacial agencies.
"V. Swamp soils; i.e., those formed from deposits made in fresh-water swamps.
"VI. Marsh soils; i.e., those formed from deposits made in marine marshes.
"VII. Dune soils; i.e., those formed from deposits of drifted sands.
"VIII. Volcanic soils; i.e., those formed from volcanic ashes.
"IX. Overplacement soils; i.e., those formed from rocks that have been transported by gravity, as talus soils, landslide soils; also those formed of alluvial cone rocks.

"Under the several species recognized above, important varieties are found.

"The classification thus briefly set forth seems to be natural, simple, and easily applied to the facts presented in field-study."

Passing over a section on correlation of formations, under the review of the work in the division of volcanic geology, Major Powell says, "For nearly two years Captain Dutton has been occupied in the investigation of the Charleston earthquake, and in preparing a monographic report upon it. In many respects the best observed earthquake that has ever occurred, and perhaps the most carefully studied, it has yielded results which undoubtedly add to our knowledge of such phenomena. But Captain Dutton, after two years of laborious investigation, is still of the opinion that the result adds but little to our knowledge of the ultimate causes which produce such catastrophes."

The remainder of Major Powell's report includes a review of geological work in connection with the Potomac formation and in Montana, and of the extensive paleontological investigations that have been carried on. A review is also given of the work done in the division of chemistry and physics, and the report closes with brief notices of the illustrations division and of the library.

HEALTH MATTERS.

Food-Preservatives.

IN a pamphlet on the effects of food-preservatives on digestive agents, by Henry Leffman, M.D., and William Beam, M.A., the authors say that the use of antiseptics in perishable articles of food has become quite general in recent years, and has been to a certain extent the subject of legislation. Salicylic acid has been probably the most used; and while the sanitary authorities in different countries have, as a rule, opposed its use, there has been no positive evidence of its injurious action, even when continued for some time. Lehmann published in Pettenkofer's *Archives of Hygiene* several instances in which healthy male adults had taken for many days considerable doses of this acid without apparent injury. While there may be a legitimate field for the use of these agents in articles of food of a highly perishable character, and especially where the addition is made known, there can be no question that their indiscriminate use is dangerous. Independently, however, of any directly injurious action, it is important to inquire how far they may interfere with the nutritive or medicinal value of any articles with which they may be associated. The matter has been brought prominently to the notice of these chemists, in consequence of some analyses made by them in which the free use of salicylic acid in beers and malt extracts was detected. Similar results in regard to beers were found by various State boards of health and by the Department of Agriculture of the United States Government. It becomes important to inquire how far the presence of the substances may interfere with the diastasic action ascribed to preparations of malt. Of eleven samples tested, including all the extracts widely known in this market, only four had any appreciable effect on starch, and but one of these was strikingly efficient. They have undertaken to determine what retarding effect such preservatives may possess.

The antiseptics selected were salicylic acid, boric acid, sodium acid sulphite, saccharine, beta-naphthol, and alcohol. The sample of beta-naphthol was of the form now sold under the name 'hydronaphthol.'

From the experiments it will be seen that salicylic acid prevents the conversion of starch into sugar under the influence of either diastase or pancreatic extract, but does not very seriously interfere with peptic or pancreatic digestion of albumen. Saccharine holds about the same relation as salicylic acid. Sodium acid sulphite and boric acid are practically without retarding effect. Beta-naphthol interferes decidedly with the formation of sugar by diastase

but not with action of pancreatic extract on starch. Peptic and pancreatic digestions of albuminoids were almost prevented by this agent.

It is obvious from these experiments that the indiscriminate use of these agents in the preservation of food is to be regarded as objectionable and a proper subject of sanitary supervision. Their use is scarcely allowable under any circumstances, and certainly only when the nature of the preservative, and the amount, are distinctly stated. These remarks apply more particularly to salicylic acid, saccharine, and beta-naphthol; but the use of boric acid and sodium acid sulphite may be brought also under the same restrictions, because their actions on the animal functions are not yet thoroughly investigated.

CONTAGIOUSNESS OF LEPROSY. — The contagiousness of leprosy still continues to be a mooted question. Dr. Rake, superintendent of the Trinidad Leper Hospital, has made a report to the British Medical Association which embodies the results of his experiments in the cultivation of the germ of leprosy, the *bacillus lepræ*, which have been under way for the past four years. He says that (1) at a tropical temperature and on the ordinary nutrient media he has failed to grow the *bacillus lepræ;* (2) in all animals yet examined he has failed to find any local growth or general dissemination of the bacillus after inoculation, whether beneath the skin, in the abdominal cavity, or in the anterior chamber; feeding with leprous tissues has also given negative results; (3) he has found no growth of the *bacillus lepræ* when placed in putrid fluids or buried in the earth. He further says that an inquiry of this kind is practically endless, so varied are the conditions of temperature, time, nutrient media, living animal tissues, or putrescent substance, and so many are the observations necessary to avoid or lessen the risk of errors of experiment.

FATAL SEASICKNESS. — It is not often that seasickness proves fatal; and yet that it may do so under aggravated circumstances, can easily be imagined. Such an instance recently occurred on the steamer 'Dunara Castle,' on the trip from Tiree to the Clyde. The patient was a girl, aged eight years, in whom the seasickness terminated in a convulsion, which proved fatal.

MILK. — Dr. S. Henry Dessau, in a letter to the *New York Medical Record*, recommends the use of fresh condensed milk as a substitute for mother's milk. His objections to the use of cow's milk as supplied by the milk-dealers are, that during the summer months it is impossible to obtain it fresh and unadulterated in large cities, unless at a cost beyond the reach of the masses. All of the milk that is delivered in the market of New York is at least from twelve to twenty-four hours old, and has undergone rough transportation of from fifteen to thirty miles in not strictly clean vessels. The cans used in bringing the milk to the city are not cleansed until returned to their owner. By the time that the milk has reached the poorer classes, it has commonly undergone more or less adulteration, often in spite of the closest watching by the health authorities. In the course of its consumption by the average infant, it is still further liable to lactic-acid fermentation, and, even though boiled, it is not unlikely to become scorched or made otherwise unwholesome for the infant. Perhaps the most important objection to cow's milk, notwithstanding the fact that it is regarded as the nearest approach to mother's milk, is the difficult digestion of the caseine by the delicate infant whose stomach has been damaged by an attack of summer diarrhœa. This has necessitated the invention of numerous means and measures for overcoming the obstacle, the most common of which is the addition of some farinaceous substance. Such practice for an infant, previous to the eruption of its teeth, is contrary to the provisions of nature, and, though occasionally successful, cannot be defended as a general usage upon physiological principles. Dr. Dessau thinks it impossible to adulterate condensed milk, and that the caseine of condensed milk is so altered in the condensing process as to be very easily digested. He even prefers it to milk sterilized by Soxhlet's method.

DEATH BY DROWNING. — Dr. Paul Loye, according to the *Lancet*, has published some observations made by him, bearing on the phenomena which precede death by sudden immersion. The first stage of deep inspirations lasts about ten seconds, followed by a re-action caused by the resistance to the entrance of water into the bronchioles. This lasts for a minute, and is succeeded by arrest of respiration and loss of consciousness. Finally the scene closes with four or five respiratory efforts — the last. Immersion causes an immediate rise in the blood-pressure, with slowing of the heart-beats. The action of the heart remains slow but strong till death ensues. The pressure gradually lessens, but rises just before death, to fall to zero immediately afterward. The heart sometimes continues to beat feebly for about twenty minutes. The result is the same in animals which have been tracheotomized: the period of respiratory resistance is therefore due to the respiratory muscles, and not to spasm of the glottis.

INHERITED DEFICIENCY OF A TOOTH. — Dr. Cryer says, in the *Philadelphia Medical Times*, that he has, among his patients, members of the same family, representing five generations, each lacking the left lower lateral incisor tooth. An interesting feature of this remarkable instance of heredity is that one of the members of the same family has a supernumerary lower incisor.

WHOOPING-COUGH. — The value of Mobin's treatment of whooping-cough by sulphurous acid is receiving strong confirmation from many sources. Dr. Manly, in the *Practitioner*, expresses the opinion, that, if it was carried out in every case, at the end of six months the disease would be unknown. The method used by him is as follows: the patient is in the morning put into clean clothes and removed elsewhere. All his clothes and toys, etc., are brought into the bedroom, and sulphur is burnt upon a few live-coals in the middle of the room. The fire is allowed to remain in the room for five hours, and then the windows and doors are thrown open. The child sleeps in the room the same evening. About twenty-five grams (a little under an ounce) of sulphur to every cubic metre may be burnt: this is equivalent to rather more than ten grains per cubic foot. The room is fumigated in a like manner during the night; the patient practically living in an atmosphere of diluted sulphurous-acid gas for some days, while in several cases the process is repeated at the end of a week.

THE POWER OF THE IMAGINATION. — We learn from the *New Orleans Picayune* that Dr. Durand, wishing to test the practical effect of mind-disease, gave a hundred patients a dose of sweetened water. Fifteen minutes after, entering apparently in great excitement, he announced that he had by mistake given a powerful emetic, and preparations must be made accordingly. Eighty out of the hundred patients became thorougly ill, and exhibited the usual result of an emetic: twenty were unaffected. The curious part of it is, that, with very few exceptions, the eighty 'emeticized' subjects were men, while the strong-minded few, who were not to be caught with chaff, were women.

MENTAL SCIENCE.

The Recognition of Sense-Impressions.

WE inherit from so ancient a philosopher as Aristotle the recognition of the process of the association of ideas, as well as of the laws by which it acts. He distinguished association by similarity, by contrast, by simultaneity, and by successiveness. The contrast that binds together is due to an underlying similarity, and the latter term may stand for both processes. So, again, the last pair may be included under association by adjacency. In the hope of deciding which of these two general processes is the more real and generic, or whether, perhaps, the two apply to two different spheres of perceptions, Dr. Alfred Lehmann (*Philosophische Studien*, v. 1) devised a series of experiments, which, aside from their bearing upon this theoretical problem, present many points of interest.

The association of ideas is seen at work in the process of recalling, of recognizing as familiar, former impressions. We may speak of a simple recognition in which the mere identity of the present recollection with the mental impression formerly registered is the point; or of a recognition with details in which the time, place, outward circumstances, are also recalled with the remembrance of the impression, say, that of meeting a friend. To this must be added the recognition by means of these details, they serving as

the marks by which the impression is identified. Dr. Lehmann attempted to bring the problem to a simple issue by a study of the power of recognizing various shades of gray produced by the rotation of a disk partly white and partly black. Two such rotating disks were used, either of which could be disclosed without the other. First a 'normal' disk was shown; after an interval, either a darker or a lighter disk was shown; and the subject was to decide whether the second disk was or was not the same as the first. With this judgment, the direction of the difference, whether lighter or darker, is always noticed. In the first series, the normal disk was composed of equal parts of black and white; the lighter disk (only two disks were used) varied in the number of degrees of white it contained as in the table; the interval between the appearance of the two disks was thirty seconds, and the average number of correct answers in a set of thirty judgments for each of two observers was as follows: —

Degrees of white in disk	240	225	215	200	192	188
Observer B	29	30	27	29	17	18
Observer L	27	27	24	20	19	17

We see at once that the power of recognizing the identity of the disks decreases as the difference in shading between the normal and the light disk diminishes; fifteen answers of each thirty being right by the action of chance. The difference between the normal disk (180 degrees) and the disk of 188 degrees white is hardly recognized at all.

If we next complicate the matter by introducing a darker disk that shall always contain as much more black than the normal as the lighter contains more white, the power of recognizing the normal disk when it appears, though still the same act, is made more difficult, as the following table, based on a series of experiments precisely similar to those just cited, indicates: —

Degrees of white in dark disk	120	135	145	160	168	172
Degrees of white in light disk	240	225	215	200	192	188
Observer B	30	30	23	23	18	10
Observer L	23	23	22	20	14	11

Here mere guess-work would make ten answers in thirty correct. The proportion of correct answers is smaller than in the former case, markedly so when the disks approach one another in shade. An increase in the number of possible impressions out of which we are to select a particular one increases the difficulty of the act.

Again: the interval between the viewing of the two disks acts in a similar way. When but two disks were used, always differing by 12 degrees in the amount of white they contained (and the normal disk varying from 172 to 176 degrees of white), the average number of right answers per set of thirty, with the interval varying from five to a hundred and twenty seconds, was as follows': —

Interval in seconds	5	15	30	60	120
Observer B	30	26	25	19	17
Observer L	21	20	21	19	17

In explanation of the individual differences, we recall that it has been clearly shown that our memories are not equally retentive for all kinds of impressions, but that here personal inclination and talent find free play. Observer B is a student of art, with an interest for such color-distinctions, and thus naturally surpasses his companion. On the other hand, the effect of practice, tested by comparing the first half of the experiments with the last, is equally evident in both observers. It is to be noted, too, that after about thirty seconds the memory-images have been about equally obscured in both observers, B then making as many errors as L.

Dr. Lehmann holds, that, if we recognize color-shades by similarity, we should (when three disks are employed) less often fail to recognize the normal than the other disks, because we see it oftener than either of the others, it being shown every time. On the other hand, the adjacency hypothesis would not expect such a difference if the original shade was clearly held in memory. If the remembrance is indistinct, the extremes, the lighter and darker disks, would be less apt to be wrongly identified than the normal disk. The results speak in favor of the latter view. B, with a clear memory, made 107 confusions, in 55 of which he miscalled the normal disk, and in 52 of which he confused either the lighter or darker disk with the normal one or with one another. L, with a vague memory, made 165 confusions, 109 of which belong to the former class, and 56 to the latter.

For another experiment three scales, proceeding from black to white by five, by six, and by nine equal gradations, were prepared; and after viewing this scale, any one of the five, of the six, of the nine shades of gray was separately shown, and the attempt made to assign to it its place in the scale. With the scale of five grades (five observers and sixty observations), 96.7 per cent of all identifications were correct; with the scale of six shades (three observers, thirty-four observations), 70.6 per cent; with the scale of nine shades (four observers, fifty observations), 46 per cent. Dr. Lehmann believes that the five shades are so well identified because they have names attached to them, — black, white, dark gray, light gray, and medium gray, — and supports this by the fact that he succeeded in identifying the shades of nine-shade scale 75 per cent of all times by simply associating a number with each shade. This argues for the association through details or by adjacency in opposition to association by similarity.

If this adjacent mark is really the clew to recognition, then it ought to be a great help to have the two disks (in the first-mentioned experiments) shown side by side before shown separately for recognition. Furthermore, if the difference between the two disks is great enough to be clearly perceived, it ought to be no more likely to be overlooked than when it is much more marked. A comparison of the following with the first table supports both these inferences: —

Degrees of white in light disk	240	225	215	200	192	188
Observer B	28	29	21	23	19	25
Observer C	27	28	24	22	20	22

Furthermore, so slight an interval as from five to a hundred and twenty seconds ought not seriously to affect the clearness of this distinction. A comparison of the following with the third table bears evidence to the truth of this deduction (the normal disk contains 180, the lighter 215, degrees of white): —

Interval in seconds	15	30	60	90	120
Observer K	26	23	27	27	25
Observer L	23	27	23	28	25

To more completely show that this retention was not due to the persistence of a memory after-image, an interval of a hundred and twenty seconds was used, within which another recognition-experiment was made. It was found that this interruption did not seriously decrease the number of correct recognitions.

Individual differences ought likewise not to be so marked with this process, and a reference to the tables shows that they are slight. Practice has little effect. Four observers made correct identifications 'through details' 83.8, 85.8, 85.8 and 85.4 per cent of all cases, while two observers differed in the percentage of correct 'simple identifications' by as much as 83.5 and 67.6 per cent.

Dr. Lehmann thus concludes that the associative law that best explains the facts is the law of adjacency in opposition to the law of similarity.

THE MAGNET AND HYPNOTISM. — The claim that the magnet influences hypnotic phenomena is strongly upheld by Parisian experimenters, while others as boldly deny this influence. The effects attributed to the magnet can be explained as due to unconscious suggestion from the operators and the bystanders. Dr. Tanzi

agrees in this opinion, which is also the verdict of a commission appointed by the medical congress held at Paris. The results announced by the Paris doctors were not obtained, and often were replaced by directly opposite results. The experiments of all outside of Paris seem to be opposed to the alleged influence of the magnet on hypnotic sensations.

THE DREAMS OF THE DEAF. — In the course of an article on dreams, etc., Mr. J. M. Buckley (*Century*, July, 1888) mentions that he has at various times made inquiry as to the occurrence of sounds in the dreams of the deaf, and found no such instance when deafness set in before the fourth year of life. One correspondent mentions that deaf people dream of hearing, if they became deaf after learning to speak. The deaf are very sensitive to jars, waking up by the beating of a bass-drum, and this class of sensations is represented in their dream-life. These facts illustrate in a conclusive manner the dependence of the imaginative and constructive powers upon the sensations, as well as point to the existence of an era when this dependence is no longer necessary for the retention of dream-fancy.

ELECTRICAL SCIENCE.

Production of Light in the Future.

THE following very interesting extract from Prof. Oliver Lodge's 'Modern Views of Electricity,' that has appeared in *Nature*, is given in the *London Electrician*: —

"The conclusions at which we have arrived, that light is an electrical disturbance, and that light-waves are excited by electric oscillations, must ultimately and very shortly have a practical import.

"Our present systems of making light artificially are wasteful and ineffective. We want a certain range of oscillation, between seven thousand and four thousand billion vibrations per second (no other is useful to us, because no other has any effect on our retina); but we do not know how to produce vibrations of this rate. We can produce a definite vibration of one or two hundred or thousand per second: in other words, we can excite a pure tone of definite pitch, and we can command any desired range of such tones continuously by means of bellows and a key-board. We can also (though the fact is less well known) excite momentarily definite ethereal vibrations of some millions per second, but we do not at present seem to know how to maintain this rate quite continuously. To get much faster rates of vibration than this, we have to fall back upon atoms. We know how to make atoms vibrate: it is done by what we call 'heating' the substance; and if we could deal with individual atoms, unhampered by others, it is possible that we might get a pure and simple mode of vibration from them. It is possible, but unlikely; for atoms, even when isolated, have a multitude of modes of vibration special to themselves, of which only a few are of practical use to us, and we do not know how to excite some without also the others. However, we do not at present deal with individual atoms: we treat them crowded together in a compact mass, so that their modes of vibration are really infinite.

"We take a lump of matter, say a carbon filament or a piece of quicklime, and by raising its temperature we impress upon its atoms higher and higher modes of vibration, not transmuting the lower into the higher, but superimposing the higher upon the lower, until at length we get such rates of vibration as our retina is constructed for, and we are satisfied. We want a small range of rapid vibrations, and we know no better than to make the whole series leading up to them. It is as though, in order to sound some little shrill octave of pipes in an organ, we were obliged to depress every key and every pedal, and to blow a young hurricane.

"I have purposely selected as examples the more perfect methods of obtaining artificial light, wherein the waste radiation is only useless, and not noxious. But the old-fashioned plan was cruder even than this: it consisted simply in setting something burning, whereby not only the fuel, but the air, was consumed; whereby also a most powerful radiation was produced, in the waste waves of which we were content to sit stewing, for the sake of the minute, almost infinitesimal fraction of it which enabled us to see.

"Every one knows now, however, that combustion is not a pleasant or healthy mode of obtaining light; but everybody does not realize that neither is incandescence a satisfactory and unwasteful method, which is likely to be practised for more than a few decades, or perhaps a century.

"Look at the furnaces and boilers of a great steam-engine driving a group of dynamos, and estimate the energy expended; and then look at the incandescent filaments of the lamps excited by them, and estimate how much of their radiated energy is of real service to the eye. It will be as the energy of a pitch pipe to an entire orchestra.

"It is not too much to say that a boy turning a handle could, if his energy were properly directed, produce as much real light as is produced by all this mass of mechanism and consumption of material.

"There might, perhaps, be something contrary to the laws of nature in thus hoping to get and utilize some specific kind of radiation without the rest; but Lord Rayleigh has shown, in a short communication to the British Association at York, that it is not so, and therefore we have a right to try to do it.

"We do not yet know how it is true, but it is one of the things we have got to learn.

"Any one looking at a common glow-worm must be struck with the fact that not by ordinary combustion, nor yet on the steam-engine and dynamo principle, is that easy light produced. Very little waste radiation is there from phosphorescent things in general. Light of the kind able to affect the retina is distinctly emitted; and for this, for even a large supply of this, a modicum of energy suffices.

"Solar radiation consists of waves of all sizes, it is true; but then solar radiation has innumerable things to do besides making things visible. The whole of the energy is useful. In artificial lighting nothing but light is desired: when heat is wanted, it is best obtained separately by combustion. And so soon as we clearly recognize that light is an electrical vibration, so soon shall we begin to beat about for some mode of exciting and maintaining an electrical vibration of any required degree of rapidity. When this has been accomplished, the problem of artificial lighting will have been solved."

ENERGY ABSORBED BY DIFFERENT LIGHTS. — Mr. Preece, in his address before the British Association, gave some figures on the energy required to produce a light of one-candle power from different illuminants.

One	candle	light	maintained	by	tallow absorbs	124	Watts
"	"	"	"	"	wax absorbs	94	"
"	"	"	"	"	sperm absorbs	86	"
"	"	"	"	"	mineral oil absorbs	80	"
"	"	"	"	"	vegetable oil absorbs	57	"
"	"	"	"	"	coal-gas absorbs	68	"
"	"	"	"	"	cannel-gas absorbs	48	"
"	"	"	"	"	electricity (glow) absorbs	3	"
"	"	"	"	"	electricity (arc) absorbs	5	"

The relative amounts of heat given off may be estimated from these figures, tallow candle giving off 248 times as much heat as an arc-lamp for the same amount of illumination. As for the cost of production (Mr. Preece evidently does not include distribution), the following figures hold good in London. The cost of producing one candle light for one thousand hours is: —

	s.	*d.*
Sperm candles	8	6
Gas	1	3
Oil (petroleum)	0	8
Electricity (glow)	0	9
Electricity (arc)	0	1½

THE SHALLENBERGER ELECTRIC METER. — Among the numerous meters for electric currents that have been lately invented, that of Mr. Shallenberger is deserving of attention, from its ingenuity and apparent accuracy. It consists of a flat ring of soft iron mounted on an aluminium disk fixed on a spindle and surrounded by two coils, one of which is connected, either directly or through a small converter, with a circuit whose current is to be measured; the other of which is of an oval form closely surrounding the iron ring, and is short-circuited on itself. The meter is intended to measure alternating currents, and its action is briefly as follows. The alternating current in the first coil induces currents in both the

closed-circuit coil and the disk. These currents are in approximately the same phase. If the closed-circuit coil be placed at an angle with the main coil, then there will be a rotation of the disk, the rotary effort increasing until the angle between the coils is forty-five degrees. The shaft of the disk is geared to a train of counting wheels, which record the number of revolutions. On the lower part of the shaft are light air-vanes to resist the rotation. When the closed-circuit coil is set, and we have an alternating current passing through the main coil, there is a rotary effort on the disk proportional to the current; there is a resistance to the motion due to the air-vanes and the friction of the pivots. It is found that the result is a speed proportional, within narrow limits, to the current passing in the main coil. The following figures are taken from the test of a 40-ampère meter:—

Current in Ampères.	Reading of Meter.	Percentage of Error.
2.06	1.60	-
4.02	4.07	+1.2
5.00	4.95	−1.0
9 90	10.02	+1.2
15 00	15.10	+0 7
20.00	20 00	0.0
29.70	30.00	+1.0
37.40	37 00	−1.1
49 30	45.40	−7.9

In the last case the meter was overloaded. It would seem rather doubtful, however, even acknowledging the accuracy of the instrument tested, whether the friction of the moving parts will remain constant in use. Still experience must decide its practical value.

BOOK-REVIEWS.

A New English Dictionary on Historical Principles. Ed. by JAMES A. H. MURRAY. Part IV. Sections 1 and 2. Oxford, Clarendon Pr. f°. (New York, Macmillan, $3.25.)

WE noticed the first instalment of this great work in *Science* for April 25, 1884, and we are now glad to chronicle the appearance of the fourth part, completing the first volume (A and B) and beginning the second. It is superfluous to praise the work, especially after the high commendations it has everywhere received. It is generally acknowledged to be the best dictionary of any language, and when finished will be indispensable to every thorough student of English. Both its etymologies and its definitions are up to the standard of the best scholarship, while in spelling and pronunciation it is probably as satisfactory as any dictionary of English can be. The typography also is excellent; the definitions, quotations, and other items under each word being clearly distinguished by different kinds and sizes of type. The number of illustrative quotations taken from some five thousand writers of the past seven centuries is immense; and in this respect, as well as in others, the work will serve as the basis of all English dictionaries hereafter.

The number of words in the first volume is 31,254, of which 15,123 are under A, and 16,131 under B. Some of these, however, are merely variant forms or inflections of the main words, while others are special combinations explained under the main words; so that the number of main words alone is only 22,232, of which 12,183 are under A, and 10,049 under B. In a dictionary dealing with seven centuries of English literature there are necessarily many obsolete words; and yet it is found, that, "of the whole English vocabulary on record since the twelfth century (so far as A and B show), more than three-fourths is still in current use." The development of the language in recent times, however, has been great, owing chiefly to the progress of physical science and the consequent introduction of new scientific terms. Yet the dictionary does not contain by any means all the terms used in science, but only such as are used more or less as English words; the generic names in natural history, for instance, being mostly excluded.

In a dictionary based on historical principles, the subject of etymology is especially prominent; yet to ascertain the origin and derivation of some words has been found impossible, and the editor thinks that they are comparatively recent creations of the English-speaking peoples. Among such words he mentions 'bang,' 'blight,' 'blot,' 'blunder,' 'blunt,' 'bounce,' 'bunch,' and many others. One of the most valuable features of the work is the endeavor to trace, so far as possible, the derivation of the various meanings of a word from the original one. This subject is of great importance as illustrating the history of thought, and has been too much neglected by philologists hitherto. Sometimes the development of meaning is simple and easy to trace; but in some cases it is quite difficult, especially when the development takes place on divergent lines. For instance, the word 'canvas' is from the Latin *cannabis* ('hemp'), and the connection of most of its meanings with the original one can be readily traced; but, when used for the act of soliciting votes before an election, the affiliation is not apparent.

The difficulty of preparing such a work as this dictionary is immense. Its inception dates from a resolution of the English Philological Society passed in 1857, at the suggestion of the late Archbishop Trench. But before the composition of the dictionary could be begun, three and a half million quotations had to be made by some thirteen hundred readers; and the preparation of the work itself has proved much more difficult than the editors anticipated. Arrangements have been made, however, for more rapid progress hereafter; and Mr. Henry Bradley, who has been an assistant editor hitherto, is now engaged independently on the third volume, so that some of us, at least, may hope to see the completion of the work.

Facts and Opinions relating to the Deaf, from America. By ALEXANDER GRAHAM BELL. London. 8°.

THE above is the title of a pamphlet containing much valuable matter which Professor Bell collected in preparation of his report to the Royal Commission appointed by the British Government to inquire into the condition of the deaf. No one is so well fitted to be the spokesman of American activity in this direction as Professor Bell, and no one has proved himself more capable of increasing our knowledge of the deaf as a class, and the means of improving their condition. The report before us contains the answers of the superintendents of American schools for the deaf to a long circular letter drawn up by Professor Bell. Five general problems are discussed: (1) 'Visible Speech;' (2) the aural method; (3) intermarriage of deaf-mutes, and possibility of a deaf variety of the human race; (4) the self-supporting character of the education of deaf-mutes; (5) articulation-teaching.

(1) With regard to the use of 'Visible Speech,' the fact that o thirty-one institutions in which it has been introduced it has continued to be employed in only seventeen, argues against its universal applicability. The reasons for its dismissal are generally its difficulty of comprehension and tedium of learning. None the less, its hearty indorsement by so many superintendents shows that it has more in its favor than against it.

(2) The question of developing latent powers of hearing, and especially vocalization, in persons usually termed deaf but really only hard of hearing, is discussed at great length, with the general conviction that much more can be done in this direction than is usually understood. The good done in this way is not only a more or less questionable improvement of the physical hearing, but very markedly a direction of the attention to a class of sensations usually neglected, and thus increasing the accuracy of their perception. The mechanical aids to securing for the deaf a semi-hearing of their own articulations are various, and variously valued, though all seem susceptible of improvement.

(3) Doubtless the most important topic of the inquiry is that concerning the heredity of the deaf-mute class. Professor Bell, it is well known, has written a memoir urging that the tendency of the too close association of deaf-mutes with one another, as is now in vogue, is towards the formation of a deaf variety of the human race; his statistics proving that a constantly increasing proportion of the descendants of deaf-mute parents are deaf-mutes. The superintendents of schools, however, maintain that the bulk of their experience is against the truth of this thesis. Many recommend

celibacy, but urge, that, when marriage is looked forward to by the deaf, the union of two deaf persons is much surer of being attended with happiness than when one of the party is deaf and the other hearing, and that the slight and doubtful increase of a possible deaf offspring is more than outweighed by the social and personal comfort. Others draw a distinction between the intermarriages of the congenitally deaf and those who become so in mature years, urging that the probability of deaf descendants is far greater in the former case than in the latter. Many, too, regard consanguinity as a more potent factor in the production of deafness than deafness itself. Quite otherwise is the verdict given by such scientific men as Cope, Hyatt, Brewer, Newcomb, Brooks, and Bowditch. These men are unanimous in the opinion that deafness is essentially hereditary, and that the influences now in operation are similar in character to those that a breeder would furnish to bring about a variety with certain characteristics, and that these must tend towards perpetuating deafness as a constant characteristic of a certain portion of the human species. As a possible source of light in the matter, the suggestion may be offered that the heredity of deafness may vary greatly with the disease that led to it. So many cases of deafness are due to the after-effects of serious diseases, that here is a possible mode of reconciling the opposite experiences of different observers.

(4) and (5). Under these heads are given the various usages and modes of instruction in the schools of the country, with a more or less technical discussion of them.

In general, Professor Bell has succeeded in putting together much valuable matter relating to the deaf-mute class, and the presentation of this pamphlet to the royal commissioners must increase their estimation of the work of America in this field of applied science and applied philanthropy.

NOTES AND NEWS.

AMONG the publications of J. B. Lippincott Company announced as in press, we note 'An Elementary Treatise on Human Anatomy,' by Joseph Leidy; 'A Cyclopædia of Diseases of Children, and their Treatment, Medical and Surgical,' edited by J. M. Keating, M.D.; 'Life of Henry M. Stanley,' by Rev. H. W. Little; and 'Botany,' for academies and colleges, by Annie Chambers-Ketchum. —— Ginn & Co. have in press 'Voices of Children,' a theoretical and practical guide on the topic, by W. H. Leib of the National Normal Music-School. —— The October number of *Lippincott's Magazine* is a special E. P. Roe number, the first half of which is taken up with articles in one way or another commemorative of the dead novelist. —— The Hon. Hugh McCulloch will discuss in *Scribner's Magazine* for October, free ships, revenue reform, immigration, and land-monopoly; and Prof. Arthur T. Hadley of Yale will contribute an article on 'The Railroad in its Business Relations.' —— Ginn & Co. are to be the American publishers of the *Classical Review*, which is published in London, and numbers among its contributors the most eminent classical scholars of Great Britain. American scholars will be associated in the editorship.

— In a recent valuable and timely monographic paper upon the mesozoic mammals, Professor Osborn of Princeton has shown that the previously entertained views of the paucity of primitive mammalian life is not so great as has been supposed. No less than thirty-five genera are now known, including five from the trias, and one from what in all probability is correctly considered the most recent cretaceous. That all the vast gap of the cretaceous proper, so rich in vertebrate life, has not yet presented a single mammalian form, is marvellous. Scarcely less remarkable is the fact that among the known forms there is great diversity, the teeth showing six or seven wholly distinct types, "and this at a zoölogical period which we have been accustomed to consider as the dawn of mammalian life." Further, all these types, though primitive, are essentially mammalian, a single genus only showing any reptilian affinity. Very interesting, too, are the geographical and geological relationships of the genera. Among the thirteen or more North American Jurassic genera, six have their counterparts in English rocks, and the family relationships of all the rest are very close. One family, the *Plagiaulacidæ*, has its members distributed in the trias and Jurassic of both Europe and North America, the uppermost cretaceous of America, the lowest tertiary of France and America, and probably the post-tertiary of Australia, — truly a remarkable distribution, both geologically and geographically.

— In his 'Synopsis of the Families and Genera of the North American Diptera,' Dr. Williston has rendered a great service to the students of this neglected branch of entomology by bringing together in small compass so convenient and useful a series of tables. Some of these have been given before in different writings of the author, and he has compiled a part from the works of others; but in no place will the American student find so much comprised in so compact form. By means of it any student with tact can determine with considerable certainty to what genus any of his flies belong; excepting, indeed, in the case of some of the more difficult families which Dr. Williston has not attempted to include, such as the *Nematocera* and *Muscidæ*, the latter the terror of systematists. Dr. Williston has added a bibliography supplementary to that given by Osten Sacken in his useful 'Catalogue of Diptera,' bringing the needed information regarding the literature of dipterology down to date. It should prove a stimulus to the study of the *Diptera*.

LETTERS TO THE EDITOR.

Recent Changes in the Magnetic Declination in Lower California.

REFERRING to an interesting note in *Science* for June 27, in which is given a brief account of magnetic observations lately made on the coast of Lower California and vicinity by officers of the United States steamship 'Ranger,' I beg leave to add some remarks further illustrating the change or reversal in the direction of the secular motion as noticed by the observers on the late cruise of the 'Ranger,' at Rosalio Bay. While the fact is here established by direct observations, the phenomenon had already been recognized in a discussion made in the United States Coast and Geodetic Survey Office in January last, and the results were published by permission of the superintendent of the survey, at San Francisco, Cal., in the *Mining and Scientific Press* of Feb. 18, in an article on the 'Magnetic Variation on the Pacific Coast.' Not only the fact of the reversal, but the years of the reversal of the direction of the secular motion, that is, the years when the easterly declination (or so-called 'variation') ceased to increase and commenced to decrease, are there given as follows: at San Blas, Mex., in 1856; at Cape San Lucas, Lower California, in 1873; at Magdalena Bay in 1875; and on our own coast at San Diego (Cal.) in 1883, at Santa Barbara in 1880, while at Monterey the reversal is expected about 1899. The annual decrease of the declination as given in that article is as follows: —

Year.	San Blas.	San Lucas.	Magdalena Bay.	San Diego.	Santa Barbara.	Monterey.
1885	+2′.9	+1′.2	+1′.0	+0′.1	+0′ 4	−0′.9
1890	+3 .3	+1 .6	+1 .4	+0 .4	+0 .7	−0 .6

The fixation of these dates became possible through the discovery by Assistant G. Davidson of the records of magnetic declinations made A.D. 1714 off the coast of Mexico, and transmitted by him to the Coast and Geodetic Survey Office, where they were discussed by Assistant C. A. Schott.

While the results published in February last supersede those given in the annual report for 1886 (Appendix No. 12, pp. 290–407), no improvement can be made in the expression for the secular variation of the declination at San Francisco, for which place the calculated reversal from increasing easterly to decreasing easterly declination is predicted for 1893. At that time the declination will not sensibly differ from 16°36′ east, — its then extreme value. Owing to discord among the individual observations, these predicted years are subject to an uncertainty of several years; as shown, for instance, in the case of Monterey, for which the calculation appears to assign too late a date. The accurate observations

made at Los Angeles, at the Coast and Geodetic Magnetic Observatory, by means of automatic photographic registry, point to a very recent (just before the establishment of the observatory in 1882) occurrence of the maximum east declination at that place.

In passing up the Pacific coast, we notice everywhere in Oregon and Washington Territory that either the reversal of the secular motion has already occurred, or is about to occur shortly. The present is therefore a very important epoch in the science of terrestrial magnetism as relating to our western coast, and hence demands special watchfulness on the part of the survey, in order that its charts may show our latest knowledge respecting this, to the navigator, most important information. C. A. S.

Washington, Sept. 21.

Archæological Remains in the Costa Cuca (Guatemala).

DURING my late archæological tour through Central America, I met an intelligent countryman of mine, Mr. Hermann Wundram, who spoke very enthusiastically of the mounds and idols on the coffee-plantation Santa Margarita, of which he is the *administrador*. After having visited the ruins of Iximché, Utatlan, and other places of historical interest in the Altos of Guatemala, and being anxious to see these remains, of which, to my knowledge, no explorer has made any mention, I rode from Quetzaltenango down to Retalhuleú, in whose vicinity they are situated.

Scattered over a vast area on the plantations of Santa Margarita and San Isidro, they consist of foundation-walls of stone edifices, and of a number of mounds of different heights and circumferences, either single or in pairs. One of the mounds has been used until recently as a burial-ground by the Indians. Their relative position cannot be determined, as the dense coffee-plantations can be penetrated but with the utmost difficulty.

In the neighborhood of the mounds stand upright sculptured monoliths, or lie half buried in the ground. On two of these appears in low relief the figure of a twisted serpent, surrounded by ornamental scrolls artistically executed. The ornaments have, however, no resemblance to Mexican picture-writings or to Maya hieroglyphs. One of the serpents looks at a rectangular shield in the centre of the slab, 13 inches high and 9 inches wide, and divided into four panels, the upper panel ornamented with two figures such as here given. This stone is 4 feet 6 inches wide, 5 feet above and 1 foot 6 inches below the ground.  In front of it stood a half-burned tallow candle, as an offering of the Indians, who adore these relics of their ancestors as saints, — a queer mixture of Pagan heathenism and Christian belief.

The other stone is 3 feet 8 inches wide and 4 feet 4 inches high, but the upper portion is broken off. On several of the monoliths the figures are so much obliterated, that only a few triangles and rectangles in groups can be made out; and on one of them, apparently of grayish marble (12 feet 9 inches high and 5 feet wide), but a few lines could be distinguished. A stone figure (5 feet 9 inches high and 3 feet 2 inches wide) representing the upper half of a man, and resting on a double base of oval form (4 feet wide), had but four fingers on the clumsy hands; and of the square face, only the broad-cornered nose and half of the right eye could be recognized. At the side of the figure lay a small statue, probably that of a child, with mutilated arms and broken-off head.

Near by was a cylindrical stone, of 28 inches diameter, in the form of a millstone, with a cavity of 22 inches diameter in the centre, and a half-oval annex at the lower end. A similar stone found here, but without the annex, had been placed on one of the corners of the yard in front of the planter's residence. The central cavity was of the same width as that of the former stone, but the margins were partially ornamented. I could not make out any other explanation of their use, but that these stones had served as receptacles for the hearts of the victims, after these had been torn from the breast; at least, they had a striking resemblance to the Cuauhxicalli of the ancient Mexicans.

At another side of the yard stood the sculptured bust of a man, also found in the ruins, 3 feet high, and resting on a base 11 inches high. The face was nearly round; eyes, nose, mouth, and rectangular ears, very large; the forehead low and much receding; the arms bent over the chest, with no hands; the back flat, as having leaned against some object. An obtuse-angled collar, reaching to the middle of the chest, seems to indicate that the figure represents a chieftain.

The rude and clumsy stone figures contrast strangely with the admirably correct and artistically executed reliefs of the monoliths: hence the inference seems to be justified that both belong to different peoples and different periods, — an inference which indeed is confirmed by the tradition of the Indians. They report that a city flourished here many years ago, but that it was destroyed by the Chinantecos. The latter term is derived from *chinamitl*, a Nahuatl word which signifies 'an enclosure of reeds' (*Seto ó cerca de cañas; chinantia, hacer seto* — Molina). The *Chinantecos* are therefore the makers and inhabitants of such enclosures. But to what known tribes does the term refer? When I travelled from Lake Atitlan, the most beautiful I ever saw, to Chichicastenango, and from Santa Cruz del Quiché to Totonicapam, — districts still inhabited by the Quichés and Cakchiquels, — I discovered the interpretation of the name. The dwellings of these Indians, mere huts of reeds and wooden sticks, nestle on the declivities of the hills or in the ravines, surrounded by *milpas*, and enclosed by fences of the above material, often scattered over an area of a square league. It is the same mode of settlement, which, according to Ximenez, was even at his time peculiar to the Quiché tribes, and bespeaks their ancient social organization. A number of these *chinamitales* formed the *amac* ('clan, gens') ruled by an *ahagua*. These *ahaguas*, in turn, constituted the great council of the tribe, without whose consent nothing could be disposed of.

That in the Indian tradition above quoted the name 'Chinantecos' refers really to the Quiché tribes, is corroborated by other aboriginal testimony. Indeed, we know from the 'Popol Vuh' and from the 'Titulo de los Señores de Totonicapam,' that the Quichés had extended their conquests under Quicab, who seems to be identical with the Hunahpú of Iuarros and of the 'Isagoge Historico,' down to the Pacific coast. Furthermore, we know from the 'Titulo de los Señores de Quetzaltenango,' that the country between Mazatenango (Cakolqueh) and Mazatlan was tributary to the Quichés; nay, even in the list of tributes, fish from the rivers Samalá, Uquz (Ocos), Nil, and Xab are enumerated. The fact that the ruined city is situated between the two last-named rivers, renders it almost a certainty that its inhabitants belonged to these tributary tribes, and that, from giving their conquerors a Nahuatl name, they were of Nahuatl origin.

There is another circumstance which points in the same direction; namely, the feathered serpents on the sculptured monoliths. They doubtless bespeak a Quetzalcoatl cult, — a cult conspicuously flourishing among the Nahuatl tribes. Four immigrations of such tribes into Guatemala are recorded by the Mexican and Spanish historians. The first one is that of the Toltecs after the destruction of Tollan, the seat of their great council-house (Ixtlilxochitl); the second, that of the Mexicans and Cholultecas, driven from Soconusco by the Olmecas, part of whom settled in Guatemala and San Salvador as Pipiles (Torquemada); a third one took place during a famine under the first Mocteuhzoma (Motolinia, Gomara, Herrera, Oviedo); and the last one under Ahuizotl, who, at the end of the fifteenth century, sent soldiers, under the disguise of merchants, to the Pacific coast of Guatemala, in order to form a nucleus for subduing the Quiché tribes (Iuarros).

For chronological reasons, and from the fact that the Toltecs were the most advanced of the Nahuatl tribes in the arts, I am inclined to attribute to them the origin of the ruined city and of the monolithic slabs, while I would assign to the Quichés the rude stone figures, since the latter present some resemblance to the clay idols found by Stephens in the ruins of Utatlan.

But while the sculptures on the monoliths in Santa Margarita and San Isidro show the same artistic skill and taste as those in Santa Lucia Cotzumalguapa, they are quite different from those in Quirigua, which I visited later on. The reliefs are lower, the objects represented dissimilar, and hieroglyphs totally absent.

Careful explorations in the dense forests along the Pacific coast would undoubtedly reveal more ruins and sculptures similar to those of Santa Margarita, which, along with those of Santa Lucia, would give additional proof of the Toltecan occupancy of this territory. GUST. BRUEHL, M.D.

Cincinnati, O., Sept. 12.